STATEMENT OF BASIS

COMPONENT CLEANING FACILITY SWMU 30
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
KENNEDY SPACE CENTER
BREVARD COUNTY, FLORIDA

PURPOSE OF STATEMENT OF BASIS

This Statement of Basis (SB) has been developed to inform and give the public an opportunity to comment on a proposed remedy to clean up contamination at the Component Cleaning Facility (CCF)[1]. A Kennedy Space Center (KSC) remediation team consisting of National Aeronautics and Space Administration (NASA), United States Environmental Protection Agency (EPA), and Florida Department of Environmental Protection (FDEP) has determined that the proposed remedy is cost effective and protective of human health and the environment. However, before implementing the proposed remedy, the KSC remediation team would like to give an opportunity for the public to comment on the proposed remedy. At any time during the public comment period, the public may comment as explained in the "How Do You Participate" section of this SB. After the end of the public comment period, the KSC remediation team will review all comments and issues raised in the comments and determine if there is a need to modify the proposed remedy before implementation.

WHY IS CLEANUP NEEDED?

The results of the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) indicated that several classes of compounds [i.e., volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), and metals] listed in Table 1 are present in the environment at the site, and could be potentially harmful to human health and ecosystems. This is particularly true if the groundwater is used for human consumption or contact now or in the future.

HOW DO YOU PARTICIPATE?

The KSC remediation team solicits public review and comment on this SB before implementing the proposed remedy. The remedy for the CCF will eventually be incorporated into the Hazardous and Solid Waste Amendments (HSWA) permit for the Kennedy Space Center (KSC). The public comment period for this SB and proposed remedy will begin on the date of publication for notice of availability of the SB in major local newspapers of general circulation, and end 45 days thereafter. If requested during the comment

The Cleanup Remedy

The proposed cleanup remedy for CCF includes the following components:

- Soil excavation
- Groundwater pump and treat
- Air sparge and soil vapor extraction
- Natural attenuation of groundwater to remove contaminants through natural processes
- Monitoring of groundwater to document water quality and contaminant levels
- Implementing institutional controls to prohibit the use of groundwater as a potable water supply

1. In accordance with RCRA ♣§7004(b), this Statement of Basis summarizes the proposed remedy for NASA KSC Component Cleaning Facility (CCF). For Detailed information on the site, consult the CCF RFI and CMS Reports, which are available for review at the information repository located at the NASA Document Library, North Brevard Library, 2121 South Hopkins Avenue, Titusville, FL 32780, telephone: (321) 264-5026.

period, the KSC remediation team will hold a public meeting to respond to any oral comments or questions regarding the proposed remedy. To request a hearing or provide comments, contact the following person in writing within the 45-day comment period:

Mr. Timothy J. Bahr, P.G.
FDEP – Bureau of Waste Cleanup
2600 Blair Stone Road, MS 4535
Tallahassee, FL 32399-2400

The HSWA Permit, SB, and associated administrative file, including the RFI Report and the Corrective Measures Study (CMS) Report, will be available to the public for viewing and copying at:

NASA Document Library
North Brevard Library
2121 South Hopkins Avenue
Titusville, FL 32780
Telephone: (321) 264-5026

To request further information, you may contact one of the following people:

Mr. Harold Williams
Remediation Program Manager
Environmental Program Office
Mail Code: TA-C3
Kennedy Space Center, FL 32899
E-mail: harold.williams-1@ksc.nasa.gov
Telephone: (321) 867-8411

Mr. Timothy R. Woolheater, P.E.
EPA Federal Facilities Branch
Waste Management Division
Sam Nunn Atlanta Federal Center
61 Forsyth Street
Atlanta, GA 30303-8960
E-mail: woolheater.tim@epamail.epa.gov
Telephone: (404) 562-8510

Mr. Timothy J. Bahr, P.G.
FDEP – Bureau of Waste Cleanup
2600 Blair Stone Road, MS 4535
Tallahassee, FL 32399-2400
E-mail: Tim.Bahr@dep.state.fl.us
Telephone: (850) 921-9984

FACILITY DESCRIPTION

NASA established the KSC as the primary launch site for the space program. These operations have involved the use of toxic and hazardous materials. Under the RCRA and applicable HSWA permit (Permit No. FL6800014585) issued by the FDEP and/or EPA, KSC was required to perform an investigation to determine the nature and extent of contamination from Solid Waste Management Unit (SWMU) No. 30, the CCF.

SITE DESCRIPTION AND HISTORY

The CCF is a NASA-operated facility that originally was used for converting liquid nitrogen to nitrogen gas, which was then piped to the launch pads. In 1962, NASA established a component refurbishment (cleaning) facility for hardware and an analytical chemical laboratory at the CCF.

Based on environmental assessment studies performed at the CCF site, operations at the site have resulted in releases of chemicals to the environment.

The CCF encompasses approximately 14 acres of land. Much of the area consists of parking lots, and dirt roads. Inside the fenced area, which houses the tankers and structures, the ground is paved. Site location and facility maps are included as Figure 1 and Figure 2, respectively. Investigations conducted at the site include:

- 1986-1992: Surface water and sediment samples were collected from the north and south drainage ditches and grab samples were

collected from waste water discharges and sumps. Some metals and VOCs were detected, including high concentrations of trichloroethene (TCE) in the north ditch.

- 1992-1999: An RFI was conducted. Samples of surface and subsurface soil, sediment, surface water, and groundwater were collected and analyzed. Results of these analyses were used to determine potential increased human health and ecological risks. The human health risk assessment indicated that groundwater containing chlorinated hydrocarbons, primarily TCE and vinyl chloride, would result in an unacceptable increased human health risk if the groundwater was used as a source of drinking water. A Phase I ecological risk assessment (ERA) indicated that the affected habitats are not sensitive, protected, unique, or pristine; however, there were potential unacceptable risks to aquatic receptors, wading birds, and terrestrial receptors.

- 1999-2001: A CMS was completed that evaluated cleanup alternatives. Supplementary sampling was performed, primarily in three areas of the site, to locate dense non-aqueous phase liquid (DNAPL). Three areas of probable DNAPL were identified, one containing primarily TCE, and two containing primarily 1,1,2-trichlorotrifluoroethane (freon 113). In addition, supplemental soil sampling was performed to confirm the presence and extent of PCBs in soil near Building K7-562.

SUMMARY OF SITE RISK

As part of the RFI activities, risk assessments were completed in accordance with KSC's remediation team-developed Risk Assessment Decision Process Document for KSC, Florida. A human health risk assessment (HHRA) was performed in accordance with EPA guidance (RAGs, EPA 1989 and subsequent EPA Region 4 guidance). The Phase I ERA was performed in accordance with the EPA's "Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments", dated 1997.

Chemicals of Concern (COCs) identified for human health risk during the RFI were:

- Groundwater: 1,1-Dichloroethene, bis(2-Ethylhexyl)phthalate, cis-1,2-dichloroethene, trans-1,2-dichloroethene, tetrachloroethene (PCE), TCE, vinyl chloride, 3-methylphenol, 4-methylphenol, antimony, arsenic, chromium, nickel, vanadium, and freon 113.

- Soil and Dry Sediment: Polynuclear aromatic hydrocarbons (PAHs)

- Surface Water: Vinyl chloride

Increased cancer risks and non-cancer hazards were not estimated for current receptors to groundwater because of the lack of exposure pathways for any current use at the site.

The HHRA showed that assuming future use of groundwater for drinking water, potential increased cancer and non-cancer risks would be unacceptable. The estimated excess lifetime cancer risk for the hypothetical future resident was determined to be as high as 3 in 100, which is outside the EPA acceptable range of 1 in a million to 1 in 10,000 and the FDEP risk goal of 1 in a million. The main contaminants contributing to this cancer risk were TCE and vinyl chloride in groundwater. The non-cancer hazard index (HI) for the future hypothetical resident was estimated to be 46, which is above the EPA and FDEP acceptable threshold of 1.0. The main contaminants contributing to the HI was TCE in groundwater. Freon 113 is not a main contributor because its low solubility precludes dissolution into groundwater at concentrations that would present a risk to human health. However, there would be a concern if a receptor came in contact with the freon 113 as free product.

Additional soil sampling performed in January 2001 near Building K7-562 indicated that PCBs were not present in soil above industrial risk-based criteria and an average of detected PCB concentrations were below residential risk-based criteria

The ERA identified several contaminants in soil, surface water, and sediment that could potentially affect receptors exposed to these media. The primary exposure pathway is direct exposure to surface water and sediments by aquatic species and wading birds.

WHAT ARE THE CLEANUP OBJECTIVES AND LEVELS?

The remedial action objectives (RAO) are to: (1) protect humans from exposure to groundwater by preventing its use as a drinking water source in the shallow aquifer where contaminant concentrations are higher than FDEP/EPA cleanup target levels, and by implementing groundwater cleanup; (2) protect humans from exposure to soil by removing soil where concentrations exceed residential risk based criteria , and (3) remove sediment that could adversely impact ecological receptors.

Table 1 lists the COCs present at the CCF above the cleanup target levels. Constituents in groundwater are reported if the concentration was above the MCL. Freon 113, which has no MCL, was added because it was identified in a free-phase product form, although the solubility of freon 113 is below the FDEP/EPA cleanup target levels. The first column lists the chemical name, the second column lists the range of concentrations detected in groundwater, soil, and sediment present at CCF during the RFI and CMS, and the last column presents the cleanup level to be achieved at the site.

Table 1

Site-Related Chemicals of Concern (COCs)	Range of Detection	Site-Specific Cleanup Level
Groundwater (ug/l)[1]		
1,1-Dichloroethene	0.95-230	7
1,2-Dichloroethane	5.8	3
Cis-1,2-dichloroethene	0.58-9,800	70
Freon 113	1.2-26,000	210,000
Trans-1,2-dichloroethene	0.56-1,600	100
Bis(2-ethylhexyl)phthalate	13-18	6
Tetrachloroethene	0.91-9.4	3
Trichloroethene	0.99-33,000	3
Vinyl Chloride	0.59-850	1
Soil/Dry Sediment (mg/kg)[2]		
CPAHs[3]	0.17-1.4	0.1/0.5
Surface Water (ug/l)[1]		
Vinyl Chloride	6.7-190	1
Sediment (mg/kg)[4]		
Bis-(2-ethylhexyl) Phthalate	0.33-29	2.647
4,4-DDT	0.01-0.71	0.005
PCBs	0.032-25	1[5]
Endrin	0.001-0.82	0.0033[6]
Cadmium	0.03-4.9	4.21
Chromium	0.67-221	160

1. Cleanup levels are GCTLs in Florida Administrative Code 62-777. Freon 113 cleanup level based on KSC specific value. Groundwater data based on July and August 2000 sampling event.
2. Cleanup levels are SCTLs for residential/industrial exposure in Florida Administrative Code 62-777.
3. CPAHs – Carcinogenic PAHs as represented by Benzo(a)pyrene.
4. Cleanup levels are Probable Effects Levels in "Development of an Approach to the Assessment of Sediment Quality in Florida Coastal Waters." FDEP 1994.
5. EPA/FDEP established site specific cleanup level.
6. USEPA Region 4 Waste management Division Sediment Screening Values for Hazardous Waste Sites. August 1999.

CLEANUP ALTERNATIVES FOR THE CCF

Cleanup alternatives are different combinations of plans or technologies to restrict access, and to contain or treat contamination to protect human health and the environment. Several alternatives were considered as summarized below.

Soil/Sediment Contamination:

- Presumptive Remedy
  - Excavate soil/sediment contaminated above cleanup goals and properly dispose

Groundwater Freon Contamination:

- Leave in place with long-term monitoring

Groundwater (and Surface Water) VOC Contamination:

- Presumptive Remedies
  - TCE DNAPL Excavation
  - Groundwater pump and treat

- Proven Alternative Technologies
  - Air sparging with soil vapor extraction (AS/SVE)
  - Combination System - AS/SVE, groundwater pump and treat with treated groundwater re-injected (with or without the addition of bioenhancing compounds)

- Innovative Technologies
  - Bioenhancement
  - In Situ Chemical Oxidation
  - In Situ Resistive Soil Heating for TCE DNAPL

- Passive Remedies
  - Monitored natural attenuation
  - Monitoring only.

- Land Use Controls (LUCs)

There is an industry-wide knowledge of corrective measure alternatives for sites similar to CCF. As a result of years of work on similar remediation projects, a limited number of corrective actions with long-term effectiveness have been demonstrated. Several potentially applicable corrective measures were identified and screened in the CMS. Detailed information was presented concerning each potentially applicable corrective measure for contaminated groundwater.

FINAL REMEDY

The final corrective measure for groundwater contaminated above MCLs, and surface water is a combination AS/SVE and groundwater pump and treat system. Natural attenuation (monitoring of COCs only) will be used as a final, polishing step. The final corrective measure for TCE DNAPL is excavation, which will be conducted as an interim corrective measure. The final corrective measure for contaminated soils and sediments is to excavate and dispose off site. Surface water will be remedied by removing the source of contamination in groundwater, soil, and sediments. The general configuration of the remediation system is presented in Figure 3.

AS/SVE. The AS/SVE system consists of air sparge wells used for injecting air into the groundwater and SVE wells for removing air from the unsaturated zone (i.e., above the water table). Since VOCs would prefer to be in the air, the injected air strips the VOCs from the groundwater, carries them to the unsaturated zone where they are removed by the SVE system. The AS/SVE system will be installed within the groundwater plume area and south of the railroad tracks (Figure 2). This area is largely paved such that injected air can easily be captured by the SVE system.

Groundwater Pump and Treat. The pump and treat system will consist initially of five groundwater recovery wells operating at a total pumping rate of 50 gallons per minute. This system will be installed within the plume area north of the railroad tracks. This area is largely unpaved and an AS/SVE system would not be appropriate.

The extracted groundwater will be treated using a packed column air stripping tower and the treated effluent will be discharged on site to an exfiltration gallery.

To monitor the northern perimeter of the groundwater contamination plume, an additional monitor well will be installed north of the plume and east of the exfiltration gallery.

Excavation. The area where TCE was detected as free product will be excavated. A de-watering system will be installed to lower the water table and then a temporary SVE system will be installed and operated to reduce the amount of hazardous soil excavated. Following this procedure, the remaining soil containing free product will be excavated along with non-hazardous soil. The soil will be segregated and the non-hazardous soil will be returned to the excavation for later treatment using the AS/SVE. The AS/SVE will reduce the potential for leaching and the pump and treat and AS/SVE systems will address any groundwater contamination resulting from returning soil containing VOCs to the excavation

The soils in the south concrete lined ditch that contained elevated levels of PAHs will be removed and properly disposed.

The sediments in the north ditch will be excavated following additional sampling. The proposed remedy is to excavate the top foot of sediment and replace the volume of material removed with clean fill.

Land Use Controls and Natural Attenuation with Long-Term Monitoring. Natural processes such as biological degradation, dispersion, advection, and adsorption will reduce COC concentrations to cleanup levels over time. Data collected during the RFI indicates that biodegradation is occurring. Once the DNAPL is removed and active remediation is underway, degradation rates can be more easily determined. It is proposed that once active remediation reduces the concentration of COCs in groundwater to the default natural attenuation values as defined by the FDEP, the progress of the remediation effort will be evaluated to determine if the system will be turned off. Monitoring will continue until cleanup target levels are achieved.
In addition to active remediation, institutional controls will be implemented to limit the use of groundwater as a drinking water source. NASA, USEPA and the FDEP have entered into a Memorandum of Agreement (MOA) that outlines how institutional controls will be managed at NASA[2]. The MOA requires periodic site inspection, condition certification and agency notification. The area of the site that will be under institutional controls is shown on Figure 2.

POTENTIAL SUPPLEMENTAL MEASURES

Depending on the success of the remediation system at reducing the concentration of VOCs in groundwater, the addition of bioenhancing amendments may be considered. If the proposed

2. By separate MOA effective February 23, 2001, with the EPA and FDEP, KSC, on behalf of NASA, agreed to implement Center-wide, certain periodic site inspection, condition certification and agency notification procedures designed to ensure the maintenance by Center personnel of any site-specific LUCs deemed necessary for future protection of human health and the environment. A fundamental premise underlying execution of that agreement was that through the Center's substantial good faith compliance with the procedures called for herein, reasonable assurances would be provided to EPA and FDEP as to the permanency of those remedies which included the use of specific LUCs.

Although the terms and conditions of the MOA are not specifically incorporated or made enforceable herein by reference, it is understood and agreed by NASA KSC, EPA and FDEP that the contemplated permanence of the remedy reflected herein shall be dependent upon the Center's substantial good faith compliance with the specific LUC maintenance commitments reflected herein. Should such compliance not occur or should the MOA be terminated, it is understood that the protectiveness of the remedy concurred in may be reconsidered and that additional measures may need to be taken to adequately ensure necessary future protection of human health and the environment.

system is cleaning up the groundwater at a rate slower than expected, the practicality and cost effectiveness of adding bioenhancing amendments to the treated effluent will be investigated.

Hazardous soil that is excavated will either be treated on site or disposed off site at a permitted facility based on future evaluation of practicality for treatment on site.

EVALUATION OF CLEANUP ALTERNATIVES

Each cleanup alternative was evaluated to determine how each potential remedy will comply with EPA's four threshold criteria and five balancing criteria for corrective measures. The four threshold criteria for corrective measures are:

- overall protection of human health and the environment;
- attain media cleanup standards;
- control the sources of releases; and
- comply with standards for management of wastes.

The five balancing criteria are:

- long term reliability and effectiveness;
- reduction in the toxicity, mobility or volume of wastes;
- short term effectiveness;
- implementability; and
- cost.

The combination system and soil and sediment removal followed by continued Land Use Controls and Natural Attenuation with Long-Term Monitoring meets each of the threshold criteria and was determined to be the best overall approach with respect to the balancing criteria.

WHAT IMPACTS WOULD THE CLEANUP HAVE ON THE LOCAL COMMUNITY?

There would be no impacts to the local community because groundwater is not used for potable water in the vicinity of the site. On-site workers will be displaced during soil excavation and may be displaced during long-term remediation activities. The combination AS/SVE and groundwater pump and treat system alternative includes administrative actions (i.e., land use controls) to limit the use of groundwater until the cleanup levels have been reached.

WHY DOES THE KSC REMEDIATION TEAM RECOMMEND THIS REMEDY?

The KSC remediation team recommends the proposed remedy because it is a cost effective means to remediate/control groundwater in a reasonable amount of time. The long-term monitoring will be used to monitor and document reduction in contamination concentrations to the cleanup goals. The institutional controls will also prevent exposure to groundwater contaminants prior to the cleanup levels being achieved. The proposed remedy meets EPA's nine criteria for corrective measures.

NEXT STEPS

The KSC remediation team will review all comments on this SB to determine if the proposed remedy needs modification prior to implementation and prior to incorporating the proposed remedy to KSC's HWSA permit. If the proposed remedy is determined to be appropriate for implementation, then the cleanup remedy will be initiated, and a Land Use Control Implementation Plan will be developed to incorporate the institutional controls at this site into the MOA.